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ABSTRACT

The purpose of this study was to investigate the effect of reduced class size on achievement in the primary grades. Scores on a variety of tests were used to compare the achievement of groups of primary students who had been enrolled in Indiana's Project Primetime with the achievement of cohort groups who had received instruction in larger classes prior to the implementation of the Primetime project. Tests focused on basic skills, competence, self-concept, and attitude toward school. Significant differences favoring the smaller classes were found for local skills tests, the affective measures, and all Iowa Test of Basic Skills (ITBS) scores for grades 1 and 2. In grade 3, however, the math subtest of the ITBS was the only one of six subtests that showed significant differences favoring the smaller classes. For the grade 3 Indiana Competency Test, there were no significant differences favoring either group. Grades 1 and 2 showed a decrease in recent years compared to the dramatic gains made during the first years of the study. It is concluded that findings demonstrate the initial impact of state sponsored class size programs, but raise questions concerning the long-term effectiveness of state supported, reduced class size programs, particularly after the novelty of smaller classes has subsided. References and 25 data tables are included. (RH)

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PRIME TIME
at North Gibson School Corporation:
A Three Year Study

A Comprehensive Evaluation of Indiana's Program of State Supported Class Size Reduction

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Abstract

The purpose of this study was to investigate the effect of reducing primary grade class size on achievement in basic skills.

Scores on a variety of tests were used to compare the achievement of groups of primary students who had been enrolled in Indiana's Project PRIMETIME with the achievement of cohort groups who had received instruction in larger classes prior to PRIMETIME. These tests were the Iowa Test of Basic Skills (ITBS), Reading, Mathematics, and Composite Subtests for grades 1, 2, and 3; the Indiana Competency Test for grade 3; Local Skills Tests in reading and mathematics for grade 1, Affective Measures of Self Concept and Attitude Toward School and the total of these two measures for Grade 1; and Social Studies and Science Supplements of the Iowa Test of Basic Skills for grade 3.

Significant differences favoring the smaller classes were found for both Local Skills Tests, the three affective measures and all ITBS scores for grades 1 and 2. In grade 3, however, the math subtest of the ITBS was the only one of six subtests that showed significant differences favoring the smaller classes. Neither social studies nor science subtests produced results favoring the smaller classes. For the grade 3 Indiana Competency Test there were no significant differences favoring either group.

Grades 1 and 2 showed a decrease in recent years compared to the dramatic gains made during the first years of the study.

The results of this study demonstrate the initial impact of state sponsored class size programs but raise questions concerning the long term effectiveness of state supported reduced class size programs, particularly after the novelty of smaller classes has subsided.

Background of the Problem

Does class size make a difference in achievement? That is a burning question on the minds of those involved in education today. Teachers, administrators, parents, students, politicians, and others seem to have strong opinions on the topic.

Teachers proclaim the advantages of smaller classes by proposing that in such classrooms teachers would be able "to implement more creative methods, to individualize instruction, and to personalize their teaching" and that these procedures would "produce greater student achievement". (Cacha, 1982)

Common sense tells us that smaller classes are better, but can that alone be enough to validate the spending of millions of dollars? Several studies have been done, but this is an area that needs to be updated with more recent findings.

Although the controversy has been in progress since the early 1900's, it became more pronounced in 1978 when two contradicting studies were published. One, by Educational Research Services, Inc. (ERS), concluded that the research done up to that point did not support the belief that smaller classes result in greater academic achievement. Instead, it was indicated that existing research was inconclusive and contradictory. This study pointed out that some teachers did not take advantage of the smaller class size by adapting their method of instruction to include individualizing.

Many studies involving class size have concentrated on processes rather than on outcome. Reseachers have found that in smaller classes each child received more individual attention from the teacher, the students paid more attention to their work, the curriculum took on greater depth, breadth, and richness, and discipline problems diminished. Educators believe that teachers are able to implement creative methods, to individualize instruction, and to personalize their teaching in small classes. (Klein, 1985)

These beliefs are explained well by Keliber (1966) who concluded that "simple arithmetic demonstrates that in large classes teachers are unable to give the individual help which may mean to a pupil the difference between success and failure.

Obviously, children cannot be treated as individuals in classes that have 35 to 45 members. In such monstrous groups the inevitable outcome is conformity, limited diagnosis of pupil needs, lack of individualized instruction, decline in teacher knowledge about individual pupils and absence of instruction that emphasizes problem solving."

A 1978 study, which was again reported in 1979, was by Glass and Smith. A meta-analysis was presented arguing that "as class size increases, achievement decreased". A meta-analysis draws its conclusions by synthesizing data from existing studies. Glass and Smith found that "more than 30 percentile ranks exist between the achievement of a pupil taught individually and a pupil taught in a class of 40." It was concluded that class size affected achievement, pupils' attitudes, the quality of the classroom environment, the instructional process, and teacher morale. There were differences between controlled and uncontrolled studies, but they both produced positive class-size effects.

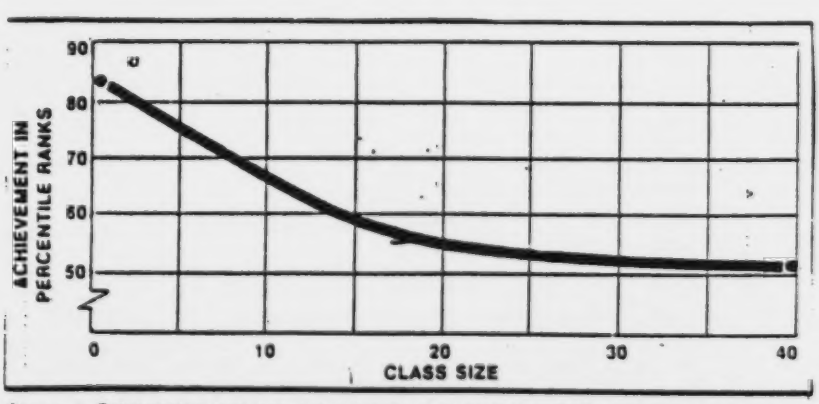


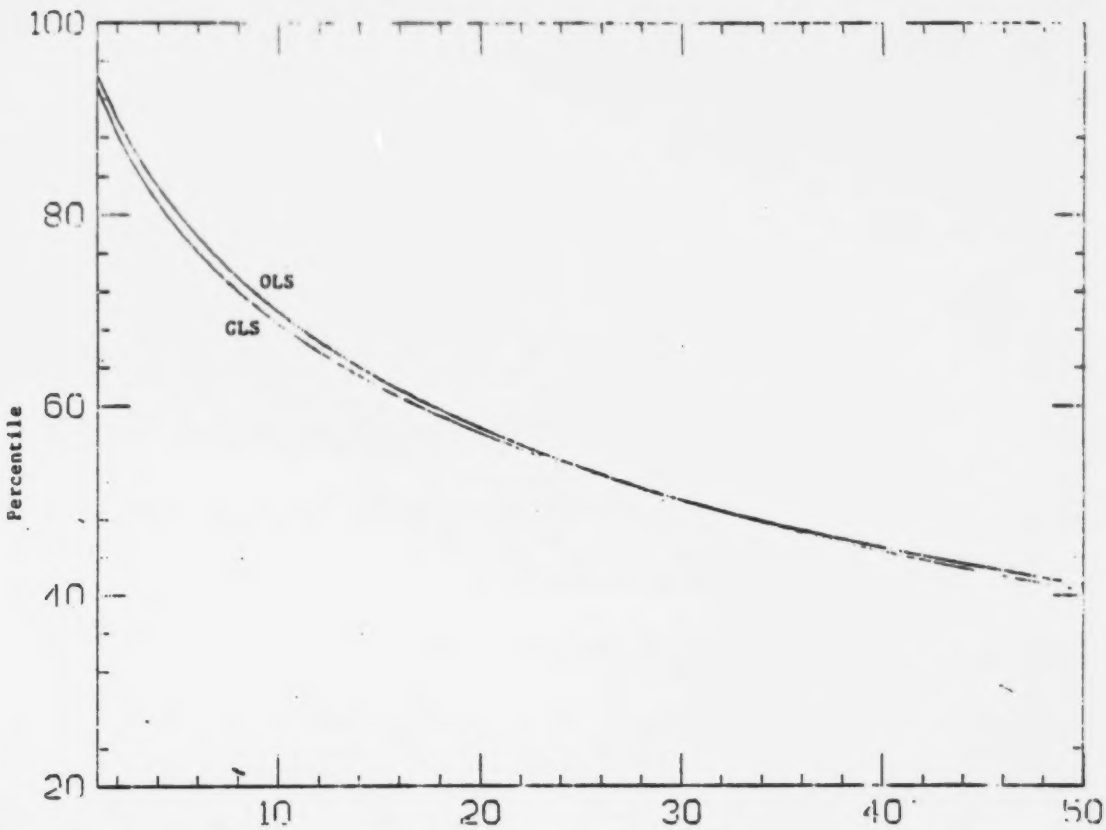
Figure 1. Relationship between achievement and class size (data integrated across approximately 100 comparisons from studies exercising good experimental control)

In 1979 Glass, Cahen, Smith, and Filby reviewed and summarized the earlier Glass and Smith articles. This study explained how the z score scale was used to interpret the 1,000 comparisons in the meta-analysis. These achievement advantage statistics were then converted to percentile rankings and grade equivalents. Results of earlier reports varied depending on how well the research was designed and when it was conducted. It was again emphasized that "pupil achievement increases as class size decreases."

In 1980 the ERS analyzed the meta-analysis of Glass and Smith (1978). The ERS strongly criticized Glass and Smith for overgeneralizing their findings. The ERS accused them of basing their research on a few studies and drawing misleading and unjustified conclusions. It was believed that Glass and Smith shifted their findings from "well-controlled" ones in the first study to "uncontrolled" ones in the second, using whichever suited their findings. The ERS pointed out that few people noticed that one side of the Glass and Smith graph indicated that there was no difference in achievement when there are 20 to 40 students. This contradicted Glass and Smith's claim that achievement decreases as size increases. The ERS study restated its 1978 findings that if teachers continue to use the same teaching techniques, there would be few benefits of reduced class size. This idea was supported by Down (1979) and Cacha (1982). Smith and Glass defended and restated their views in 1980.

Hedges and Stock (1983) also criticized the methods of meta-analysis used by Glass and Smith in 1979 and 1980. An improved statistical theory was used to reanalyze the Smith and Glass data. Hedges and Stock drew similar conclusions, however, and maintained that "smaller classes still lead to higher expected achievement than larger classes." The difference in their study is best indicated by a graph of the relationship of class size and effects on achievement. On this graph the

curves labeled OLS correspond to the Smith and Glass results. The curve labeled GLS corresponds to the Hedges and Stock study. The Hedges and Stock curve is slightly flatter but still shows an increase in achievement for smaller classes. This graph substantiates Hedges and Stock's belief that "one should not expect achievement levels for small classes to be as high as Glass and Smith (1979) indicated."



As the controversy continued certain states began their own studies and experiments on the effects of reduced class size. In Indiana Governor Robert Orr proposed Project PRIME TIME to improve reading, writing, and arithmetic skills of students in grades K-2 by reducing class size. An experimental program was set up

involving nine schools across Indiana. Based on successful results of this project, the 1983 General Assembly funded the PRIMETIME project with $2 million for a statewide program. By the 1987-88 school year this program will have grown to include grades K-3. The results of this program are still inconclusive. One early review indicated "overwhelming evidence of the gains in scores for students in the small-size classes of the 1984-85 school year," (Swan, Stone, and Gilman, 1985) As this program continues additional studies will need to be made to determine if these initial results are consistent over time.

A year long study of reading achievement at first grade level was used in eight Virginia Beach elementary schools to investigate the significance of smaller classes. (Carrington, 1983) In this study the students in the smaller (experimental) classes scored significantly higher on reading achievement tests than did the students in the larger (control) classes.

In 1984 the Tennessee legislature passed the Comprehensive Education Reform Act (CERA). This act made it possible to establish the Tennessee State University (TSU) Center for the Teaching of Basic Skills to the Economically and Educationally Disadvantaged. The TSU Center coordinated two projects: one to improve math skills and the other to improve reading and writing skills. One study determined how students in grades 1-3 were affected by a pupil/teacher ratio of 15:1. California Achievement Test Forms 10 and 11 were used to show statistical significance favoring the students in the experimental classes. (Bain and Achilles, 1986)

Bain and Achilles (1986) also described Tennessee's Project Star. This project is a statewide demonstration on class size funded by the Tennessee legislature ($3 million) which began in the 1985-86 school year. It is to continue for four years and will compare three types of classes: small classes (13-17), students regular classes

(22-25) with a full time aide, and regular classes without an aide.

Not only have various states in the United States decided to study the effects of class size on achievement, but other countries have done research on the topic too. Sid Bourke (1986) reported on the observations made in Australia. Thirty-three schools and sixty-three teachers were involved in a study to determine exactly how class size affects achievement. After establishing a link between class size and achievement, this study proceeded to analyze the variables that affected that significance. In the study it was determined that achievement was affected by "teachers' grouping practices, frequency and type of interaction with students, some aspects of teachers' questioning behavior, the amount of homework given, and the noise level tolerated during lessons." In opposition of Glass et al. (1982), this study found student engagement rate and individualization to be inconsequential.

The meaning of class size is also considered ambiguous by Berger (1982) who finds other measures such as pupil-teacher ratio, average class size, teacher contact hours, and teacher load to be equally ambiguous.

Shapson, Wright, Eason, and Fitzgerald (1980) reported on a study done in Ontario, Canada, in the early 1970's. Fourth and fifth graders from eleven schools in Toronto were involved. This two year study investigated teacher expectations about the effects of class size along with achievement results and student variables. It was found that teacher expectations such as more individualization and better rapport were realized in the smaller classes. Teachers also thought that achievement scores would improve, but this was not proven. Although the students improved in mathematics concepts, there was no significant difference in other achievement measures.

The tremendous cost involved in reducing class size even minimally makes this

controversy not only an educational one, but also political issue. In 1975 it was estimated that personnel costs would increase by $64 million if there were a statewide reduction of one student per class in the Pennsylvania public schools. (ERS, 1978)

Although the issue is hotly debated, it appears that most of the recent analyses favors PRIMETIME. One interesting slant to that is a study one by Hallinan and Sorensen (1985). No significant effect on learning was found in classes where teachers used whole class instruction. Hallinan and Sorensen presented an empirical study that indicated that group size rather than class size in situations where ability grouping is used was the variable that affected achievement. It was found that students in smaller ability groups learned more than those in larger groups. Although increasing class size in ungrouped classes was recommended, it was also pointed out that in grouped classes "as class size increases, the size of groups tend to increase." Because of this, "increasing class size can have an indirect negative effect on learning for low ability students."

Clearly class size is an important issue and it is one that should be updated as new data becomes available. Opinions on the topic are as varied as the types and sizes of smaller classes that are being studied. If reduced class size has a positive impact on student achievement, then the results of test scores for students in smaller PRIME TIME classes should be higher than the mean scores of a cohort group in larger classes prior to PRIMETIME.

Statement of the Problem

General Problem: How can educators increase the academic achievement of primary school students?

Specific Problem: Will reducing the class size result in students attaining higher test scores on achievement and affective measures?

Hypothesis: Students in North Gibson PRIMETIME classes will score higher on achievement and affective measures than students in larger classes. Specifically the tests to be compared are:

Achievement

Iowa Test of Basic Skills (Grades 1, 2, and 3)
- Math Subtest
- Reading Subtest
- Composite Score

Iowa Test of Basic Skills (Grade 3)
- Science Subtest Supplement
- Social Studies Subtest Supplement

Indiana Competency Test (Grade 3)
- Math Subtest
- Reading Subtest
- Communication Skills Subtest

Local Competency Tests (Grade 1)
- Math Subtest
- Reading Subtest

Affective Measures (Grade 1)
- Self Concept
- Affective Measure
- Total

METHODOLOGY

Sample Selection: The sample of this study consisted of first, second and third grade studies from the three elementary schools in the North Gibson School Corporation in Princeton, Indiana. In this rural community the population is predominantly represented by students whose parents are in a wide spectrum of income levels. The schools in this study are considered to be somewhat above national norms in school achievement but are otherwise typical of elementary students throughout Indiana and the United States.

Groups: Subjects for the study were elementary students enrolled in grades 1,

2, and 3 during the 1983-84, 1984-85, 1985-86, and 1986-87 school years. Some students (the Cohort Groups) had not been involved in the PRIMETIME project during any of their school years. Other students had been enrolled in PRIMETIME classes for consecutive years during the time they wre enrolled in school. PRIMETIME is a program that was proposed and put into effect by the Indiana General Assembly in 1984-85 to reduce first grade class size to an average student-teacher ratio of 18:1. In 1985-86 the program was expanded to the second grade level to ensure an average student-teacher ratio of 20:1. The program was extended to include third grade level in 1986-87. Table I contains the average class enrollment in the North Gibson School Corporation for the years covered in the study.

TABLE I

Class Size Average for North Gibson School Corporation

	Grade 1	Grade 2	Grade 3
1983-84	23.7	-	-
1984-85	19.9	20.5	-
1985-86	16.1	17.4	24.0
1986-87	16.6	19.1	18.0

Procedure: Smaller class sizes were implemented as prescribed by Indiana law. The first grade class began a program of smaller class size in the 1984-85 school year. The second grade reduced its number during the 1985-86 school year and the third grade followed in the 1986-87 school year.

The school's regular testing program was effected before PRIMETIME so that it was possible to compare the achievement of large classes with that of PRIMETIME classes.

Design: A Cohort study was utilized. Students who were instructed in

PRIMETIME classes were compared to their cohorts who had received instruction in larger classes. Scores on each of the twenty-two independent variables were compared for the two classes.

Specifically, the studies compared the following variables during the large class and PRIMETIME periods.

STUDIES CONDUCTED

Study #	Test	Grade	Subject	Score	Large Class	PRIMETIME
1	Local Competency	1	Math	# Right	83-84	84-85 to date
2	" "	1	Reading	"	"	" " "
3	" "	1	Math	Skills mastered	"	" " "
4	" "	1	Reading	" "	"	" " "
5	ITBS	1	Math	Percentile	83-84	84-85 to date
6	"	1	Reading	"	"	" " "
7	"	1	Composite	"	"	" " "
8	ITBS	2	Math	Percentile	84-85	85-86 to date
9	"	2	Reading	"	"	" " "
10	"	2	Composite	"	"	" " "
11	ITBS	3	Math	Percentile	85-86	86-87 to date
12	"	3	Reading	"	"	" " "
13	"	3	Composite	"	"	" " "
14	Indiana Comp.	3	Math	Raw score	85-86	86-87
15	" "	3	Reading	"	"	"
16	" "	3	Writing	"	"	"
17	" "	3	Composite	"	"	"
18	Affective	1	Self Concept	# Right	83-84	84-85 to date
19	"	1	Attitude toward Sch.	"	"	" " "
20	"	1	Total Affective	"	"	" " "
21	ITBS Supplement	3	Science	Percentile	85-86	86-87
22	" "	3	Social Studies	"	"	"

Basic Skills Tests (studies 1-4). These studies compared results on locally constructed tests of basic skills for the two-year period in an attempt to determine whether significant gains in scores could be attributable to class size. Tests were constructed by the evaluator's staff for the purpose of measuring mastery of the mathematics and reading skills that had been designated by teachers to be the curriculum content of the first grade.

Separate tests were constructed for mathematics skills and for reading skills. The mathematics tests measured thirteen skills with five items per skill for a total of 65 items. The reading test measured 16 skills with six items per skill for a total of 96 items. Tests were administered during the first week of May during each of the two school years. Tests were scored according to the number of correct responses and also according to the number of concepts that had been mastered by the student. A score of 70 percent of the items for a skill answered correctly was selected as the mastery criterion. Tests were of higher reliability with each of the two tests having reliability indexes of above .90 for each of the two years.

Study 1 compared the means of the total raw score on the Mathematics Skills Test. Study 2 compared the means of the total raw scores on the Reading Skills Test. Scores for each of the individual skills were compared to a criterion score of 70 percent. The number of skills that had been mastered by each student was determined. Study 3 compared the mean number of skills mastered for each of the two groups. Study 4 compared the mean number of reading skills that had been mastered for the two groups.

Iowa Test of Basic Skills (Studies 5-7). The Iowa Test of Basic Skills, First Grade, Form 7, and Second Grade, Form 7 were administered at each of the schools during March for each of the students. Results for the four years were compared. Study 5

compared the first grade mean raw scores for the mathematics section of the test. Study 6 compared the first grade mean scores for the reading section of the test. Study 7 compared the first grade mean composite score. A composite score for the test was arrived at by determining the combined score for the reading, language arts, and mathematics sections of the test.

Studies 8, 9, and 10 made comparisons of the Mathematics, Reading, and Composite Subtest scores for the second grade means and Studies 14, 15, and 16 made similar comparisons for the third grade means of the Iowa Test of Basic Skills. Data for these studies were the same as for studies 5, 6, and 7 except that second and third grade data were analyzed.

Indiana Competency Test (Studies 14-17). The test results used in this study came from the Indiana Basic Competency Test that was administered to each of the classes in the study near the end of their third grade year. This test was a statewide test designed to measure achievement in the basic skills with the purpose of implementing remediation programs.

The Indiana Basic Competency Test consisted of three sections that measured a student's ability in reading, mathematics, and writing. The reading test was composed of a 15 item vocabulary section and a reading comprehension section that contained 50 items that measured comprehension of reading passages. The math score was derived from a 15 item mathematics computation segment and a mathematics concepts and application part that had 25 items. In addition to the reading and math raw scores, the composite score included the scores of a 32 item writing mechanics test and a sample writing test. The composite score was derived from the following formula: reading raw score + math raw score + 1/2 writing mechanics score + 2X holistic score + 2X primary trait score = composite score.

Affective Measures (Studies 18-20). At the request of one of the principals of the participating schools, an affective measure was developed to ascertain if differences existed between the attitudes and values of the two groups.

After extensive research by the evaluator's staff into what would constitute measures of attitudes and values for first grade students, a 37-item affective test of the Likert variety was constructed. Research had shown that the only meaningful measures of attitudes and values for children as young as the study subjects were self concept and attitude toward school. These measures were performed and a total affective measure was obtained by adding the scores for self concept and attitude toward school.

Indiana Competency Test. During the two years of the study, all Indiana third grade students were assessed by the Indiana Competency Test. There are four subtests to measure competency in mathematics, reading, writing, and composite. Studies 14, 15, 16, and 17 compared the means of the large class and PRIMETIME groups on these measures.

Iowa Test of Basic Skills, Social Studies and Science Supplements, Grade 3 (Studies 21 - 22). Since social studies and science subtests scores were available for all who participated, these scores were also analyzed.

Statistical Analysis. All tests were machine scored and analyzed by computer methods. Results were tested for significance by the two-way analysis of variance procedures of the Statistics with Finesse statistical package.

Results were analyzed subjectively and were tested for significance. This study reported the level of significance as determined by the analysis of variance with results tested at the .05, .01, .001, and .0001 levels.

RESULTS

. Table II containing data from this study is in this section. Complete analyses and visual representations are in Tables III through XXIV and Figures 1 - 8 in the Appendix of this report.

Local Competency Tests. Results for the local competency test studies (Studies 1 - 4) are contained in Tables III - VI and Figures 3 and 4. From these visual representatives of the data it is apparent that the introduction of PRIMETIME produced a highly significant and dramatic impact on school achievement.

However, in recent years there has been a decrease in impact as schools continued PRIMETIME. Not only have scores decreased in recent years, but there have been decreases for the past two years, which are statistically significant losses. However, the overall impact of PRIMETIME in the first grade is significantly greater than the impact of first grade classes before PRIMETIME existed.

Iowa Test of Basic Skills, Grade 1. Results from the Grade 1 administration of ITBS are summarized in Tables VII and IX and Figure 5. A similar effect is noted from this data as was noted in the previous studies regarding local skills tests. After an initial increase in achievement, it can be noted that scores have begun to decrease in recent years. However, unlike the decreases in local competency test, the decreases on the ITBS were not significant.

Iowa Test of Basic Skills, Grade 2. The results of the Iowa Test of Basic Skills for Grade 2 are contained in Tables X - XII and Figure 6. From the graph, it can be noted that the significant achievement gains in the mathematics, reading and composite scores noted after the first year of PRIMETIME have been maintained in 1986-87.

Iowa Test of Basic Skills, Grade 3. The third grade's scores on the ITBS are contained in Tables XIII - XV and Figure 7. From these representations, it is apparent

that there were gains in mathematics and composite scores, although only the math gain was statistically significant. The slight decrease in reading achievement for the PRIMETIME group was not significant.

Indiana Competency Test. Scores from the 1986 and 1987 administration of the Indiana Competency Tests are presented in Tables XVI - XIX and Figure 8 to illustrate how scores on these subtests changed after the introduction of PRIMETIME. Results to indicate that the 1978 administration of the test produced little changes in scores can be found for the two administrations of the tests. The slight increase in mathematics and reading and the slight decrease in writing and composite scores were not significant.

Affective Measures. The affective measures of self concept and attitude toward school as well as the combined total of these measures are presented in Tables XX - XXIII and Figure 9. Results indicate that the significant gains in these measures that were experienced during the first year of PRIMETIME were maintained during the later years of the study.

Iowa Test of Basic Skills, Social Studies and Science Supplement. The results of the ITBS Social Studies and Science Supplement are contained in Tables XXIII and XXIV and Figure 10. Mean scores on each test increased slightly. The increase was not statistically significant.

Discussion, Conclusions, and Recommendations

Results repesented here constitute a formative product evaluation of the PRIMETIME program of the North Gibson School Corporation.

A synthesis of the results would indicate that after PRIMETIME was initially implemented, there was a dramatic increase in test score results. In subsequent years, not only has the amount of this increase been reduced, but scores in Grade 3 have not increased as dramatically as did the scores in early years of PRIMETIME.

In fact, many of the early gains experienced as a result of PRIMETIME being introduced in Grades 1 and 2 have seemed to disappear in Grade 3.

An overall evaluation of the North Gibson PRIMETIME would indicate that the program still has a highly significant effect on achievement in the school system, although some of its original impact has not lasted. This is particularly noticeable in Grade 3.

Particular attention should be directed to the third grade where the PRIMETIME program has had little positive impact. Perhaps the Grade 3 teachers have taken reduced class programs in stride or have not used class size reduction to its fullest potential.

The third grade performance is particularly disappointing since these same students scored much higher as PRIMETIME students when they were in Grades 1 and 2. Evidently the third grade PRIMETIME program has eroded the gains made by

PRIMETIME in Grades 1 and 2.

Nevertheless, the continuation of PRIMETIME continues to produce its desired results on all measures utilized in this study.

APPENDIX

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Table III

Local Skills Test, Number Correct, Mathematics, Grade 1
(Study 1)

	Mean Scores			
	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean	49.1	56.0	54.3	52.4
Standard Deviation	8.9	9.6	10.0	10.1
Average Class Size	23.4	17.9	16.1	16.6

F Ratio = 8.75 (p <.001)
Tukey's W Procedure Significance Level 5

	1985	1986	1987
1984	.001	.001	.001
1985		.001	(-.001)
1986			n.s.

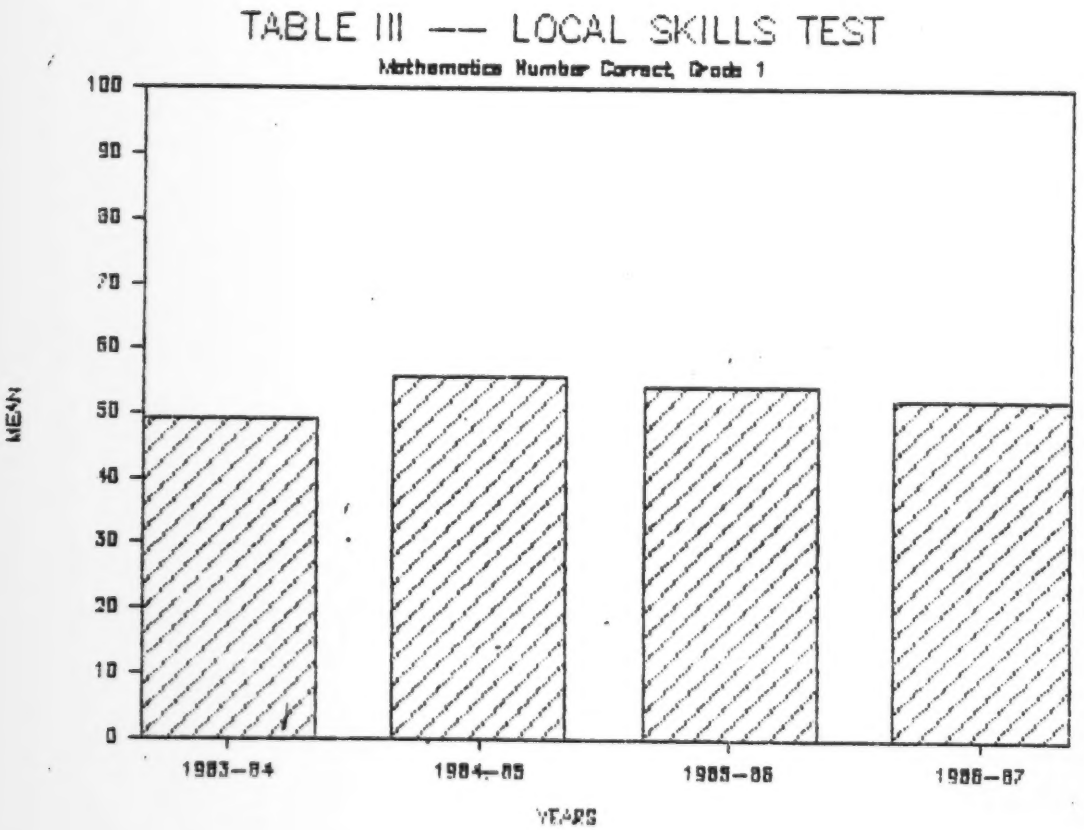

Table IV

Local Skills Test, Skills Mastered, Reading, Grade 1
(Study 2)

	Mean Scores			
	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean	71.9	79.9	78.4	77.1
Standard Deviation	10.1	9.7	10.5	10.9
Average Class Size	23.4	17.9	16.1	16.6

F Ratio = 8.75 (p <.001)
Tukey's W Procedure Test of Significance

	1985	1986	1987
1984	.001	.001	.001
1985		(.05)	
1986			n.s.

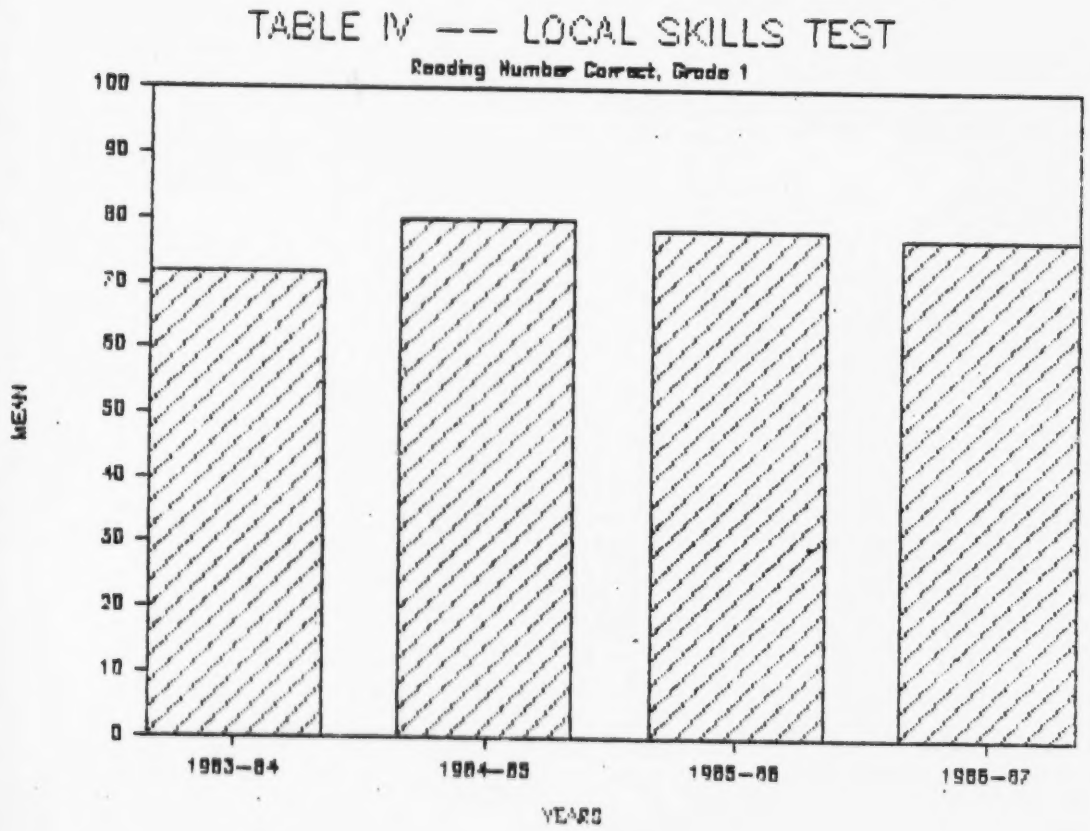

Table V

Local Skills Test, Skills Mastered, Mathematics, Grade 1
(Study 3)

	Mean Scores			
	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean	8.5	11.8	11.3	10.9
Standard Deviation	2.0	2.3	2.3	2.5
Average Class Size	23.4	17.9	16.1	16.6

F Ratio = 3.15 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985		n.s.	n.s.
1986			n.s.

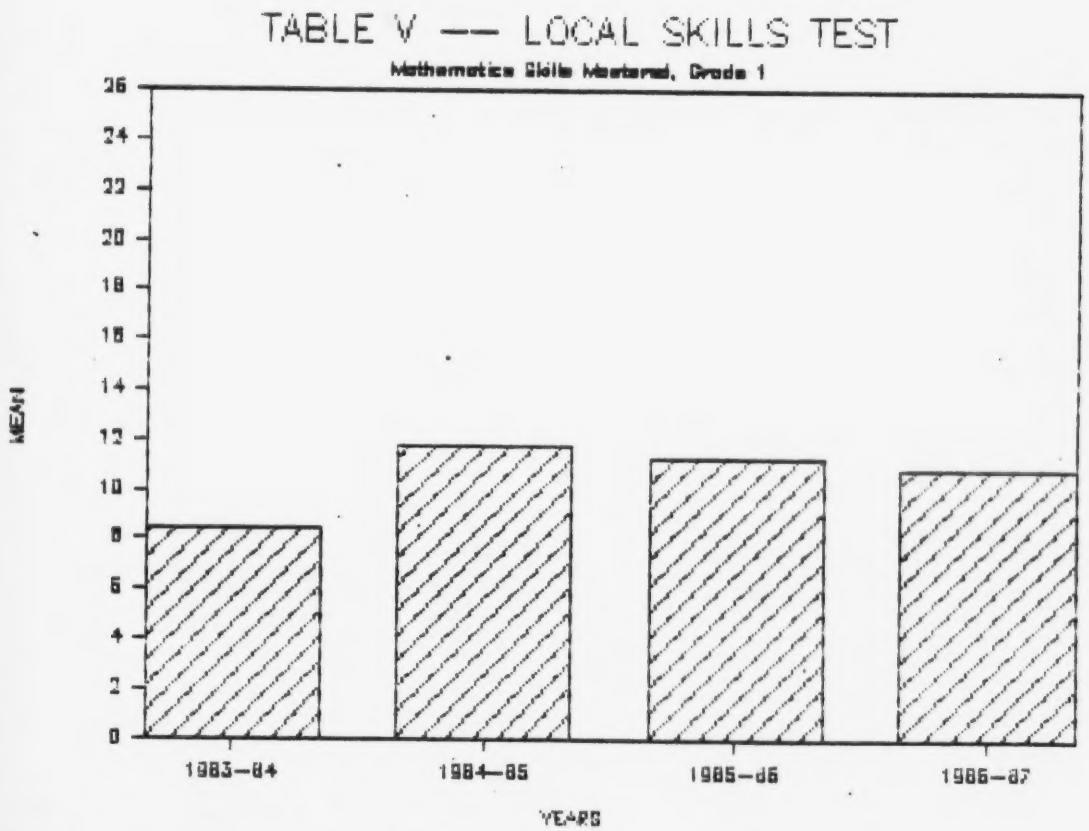

Table VI

Local Skills Test, Skills Mastered, Reading, Grade 1
(Study 4)

	Mean Scores			
	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean	10.6	13.6	13.3	13.1
Standard Deviation	3.1	2.9	2.7	3.4
Average Class Size	23.4	17.9	16.1	16.6

F Ratio = 3.91 (p <.001)
Tukey's W Procedure Significance Levels

	1984	1985	1986	1987
1984	-	.001	.001	.001
1985		-	n.s.	(-.05)
1986			-	n.s.
1987				-

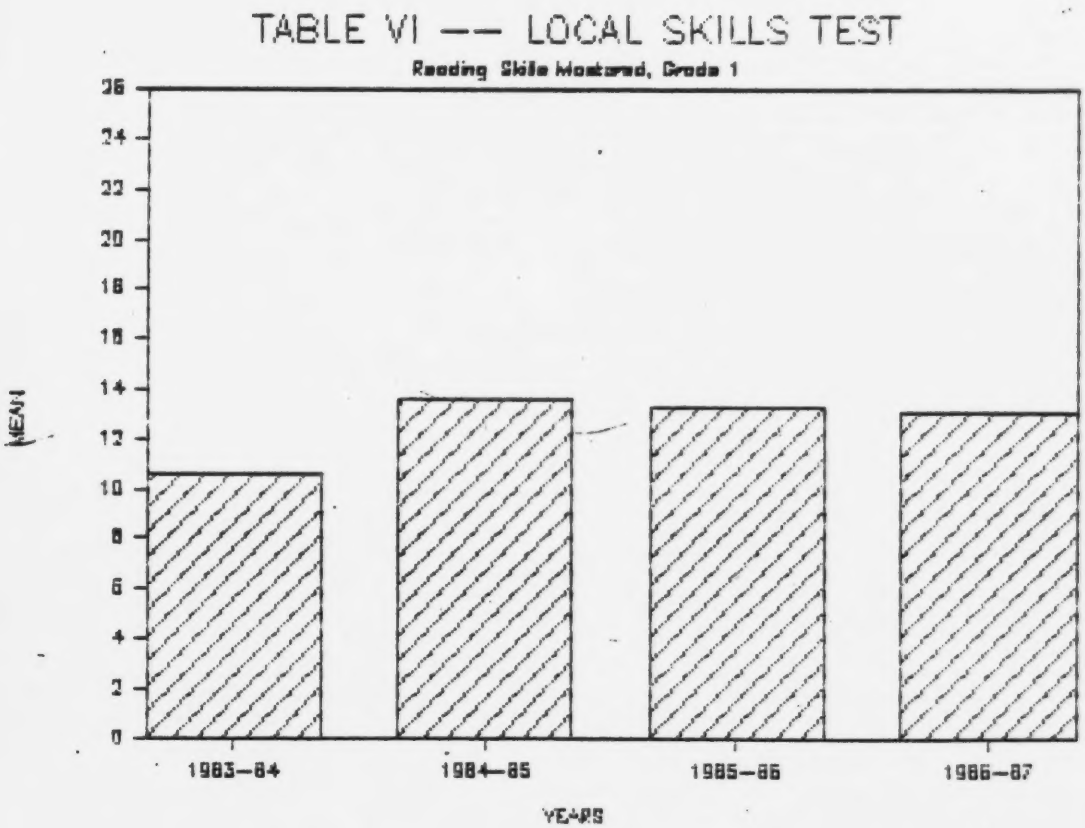

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Table VII

Grade 1, ITBS Results, Math Subtest
(Study 5)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean Percentile	59.3	70.0	79.1	77.6
Standard Deviation	18.2	18.6	18.5	21.7
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 82.1 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985	-	n.s.	(-.01)
1986			n.s.

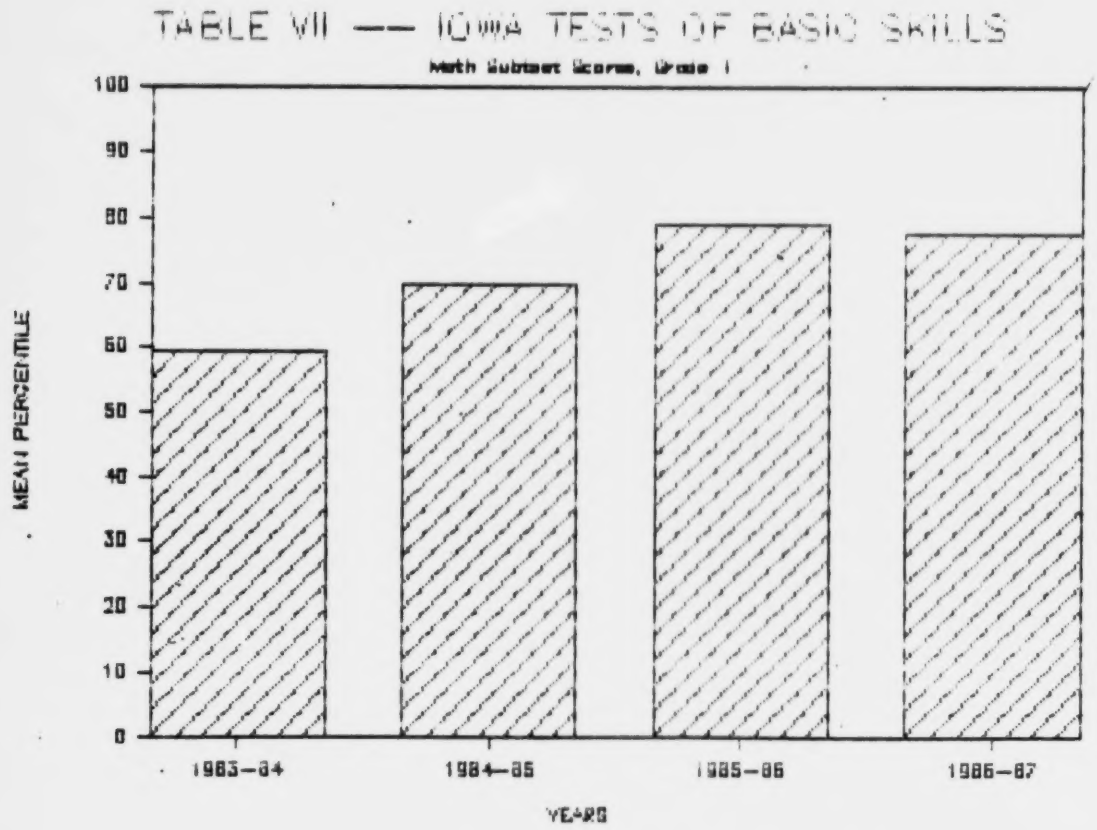

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Table VIII

Grade 1, ITBS Scores, Reading Subtest
(Study 6)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean Percentile	71.4	80.7	79.9	76.5
Standard Deviation	24.7	14.3	15.9	17.8
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 17.92 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985	-	n.s.	(-.001)
1986			(-.001)

TABLE VIII — IOWA TESTS OF BASIC SKILLS

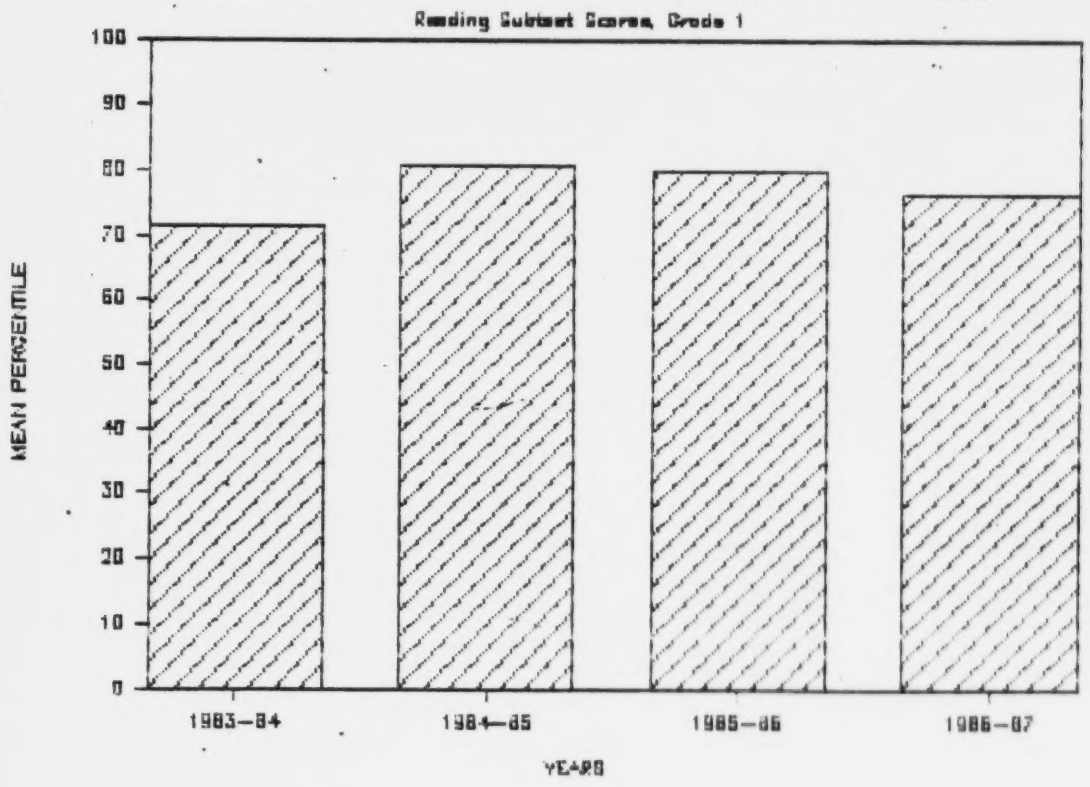

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Table IX

Grade 1, ITBS Scores, Composite Score
(Study 7)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean Percentile	58.4	76.3	80.6	76.5
Standard Deviation	16.2	17.0	15.9	17.8
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 98.17 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985		.001	n.s.
1986			(-.001)

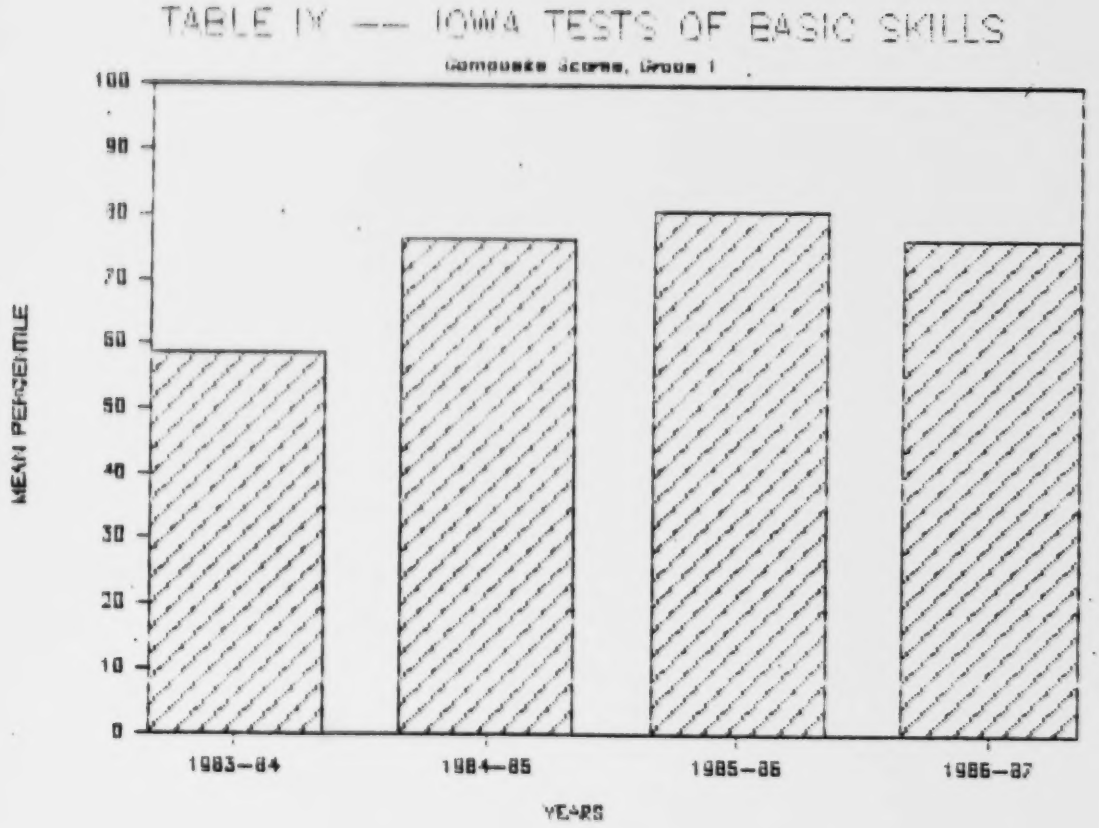

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Table X

Iowa Test Scores, Math Subtest, Grade 2
(Study 8)

	1984-85	1985-86	1986-87
N	164	162	159
Mean Percentile	63.1	66.4	67.8
Standard Deviation	24.1	24.4	24.9
Average Class Size	20.5	20.0	19.1

F Ratio = 5.82 (p <.001)
Tukey's W Procedure Significance Levels

	1986	1987
1985	n.s.	.05
1986		n.s.

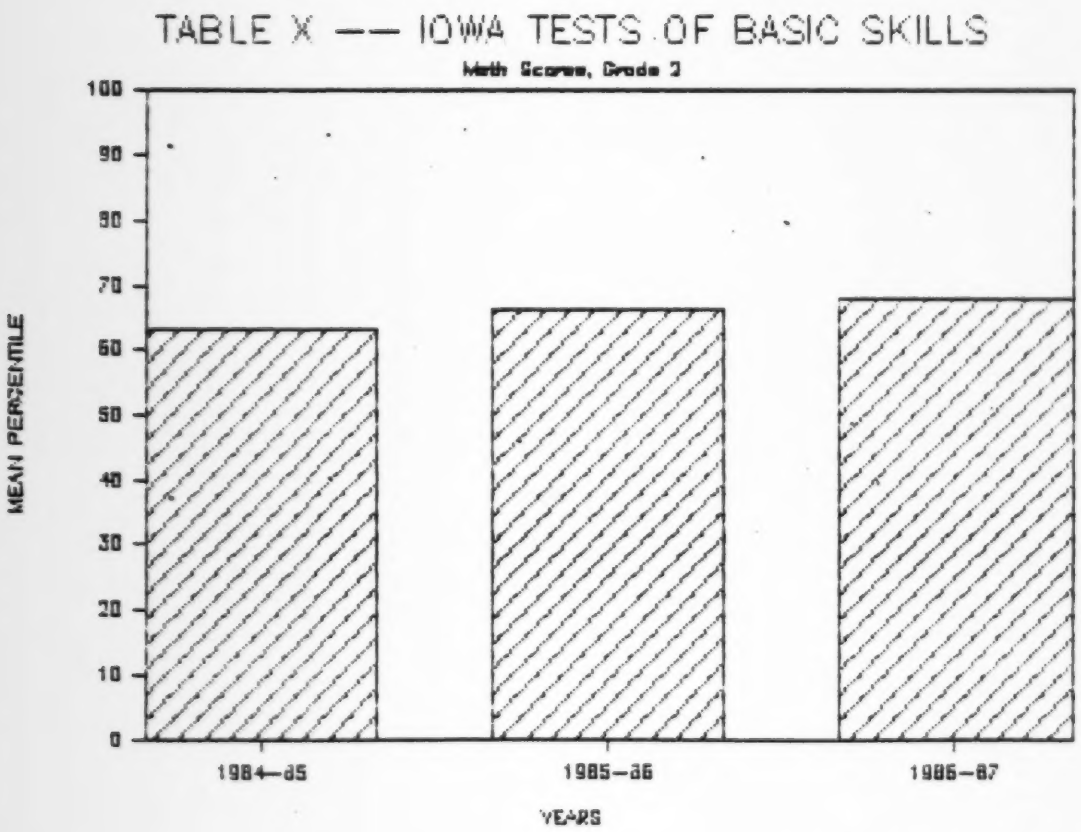

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Table XI

Iowa Test Scores, Reading Subtest, Grade 2
(Study 9)

	1984-85	1985-86	1986-87
N	164	162	159
Mean Percentile	54.5	68.9	68.5
Standard Deviation	23.1	25.1	22.8
Average Class Size	20.5	20.0	19.1

F Ratio = 62.26 (p <.001)
Tukey's W Procedure Significance Levels

	1986	1987
1985	.001	.001
1986		n.s.

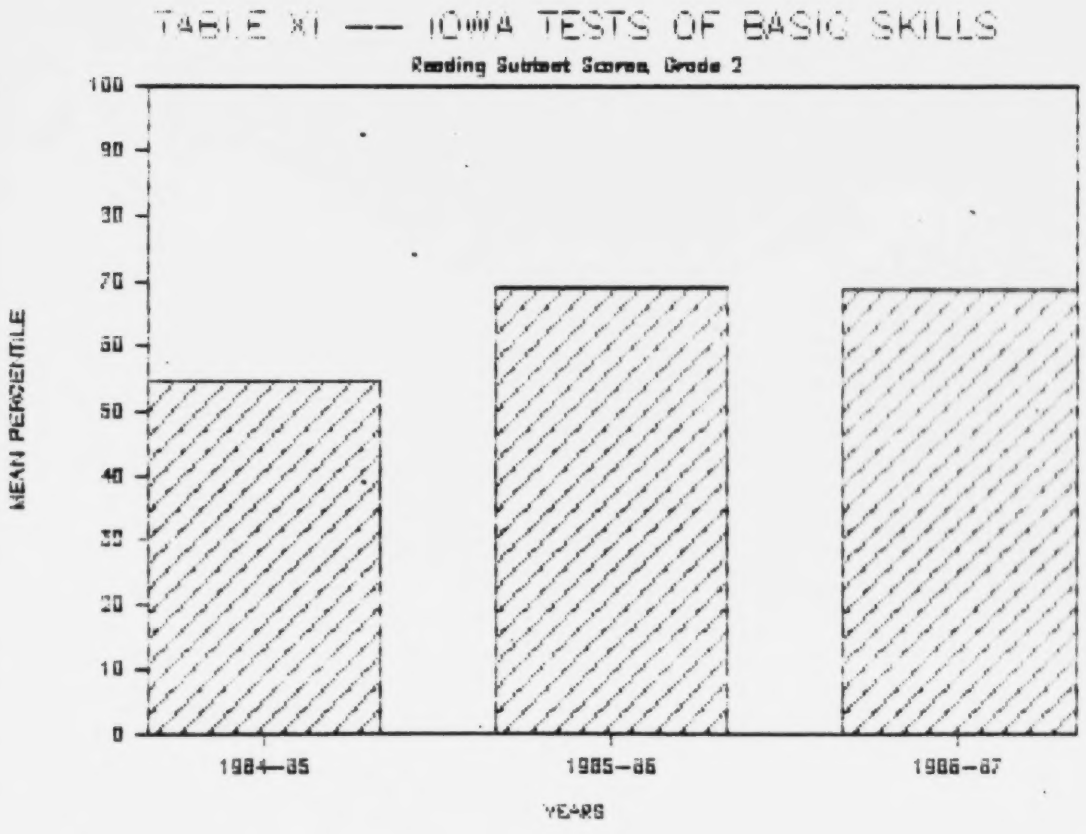

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Table XII

Iowa Test Scores, Composite, Grade 2
(Study 10)

	1984-85	1985-86	1986-87
N	164	162	159
Mean Percentile	63.2	71.4	70.8
Standard Deviation	21.9	22.8	21.9
Average Class Size	20.5	20.0	19.1

F Ratio = 20.89 (p <.001)
Tukey's W Procedure Significance Levels

	1986	1987
1985	.001	.001
1986		n.s.

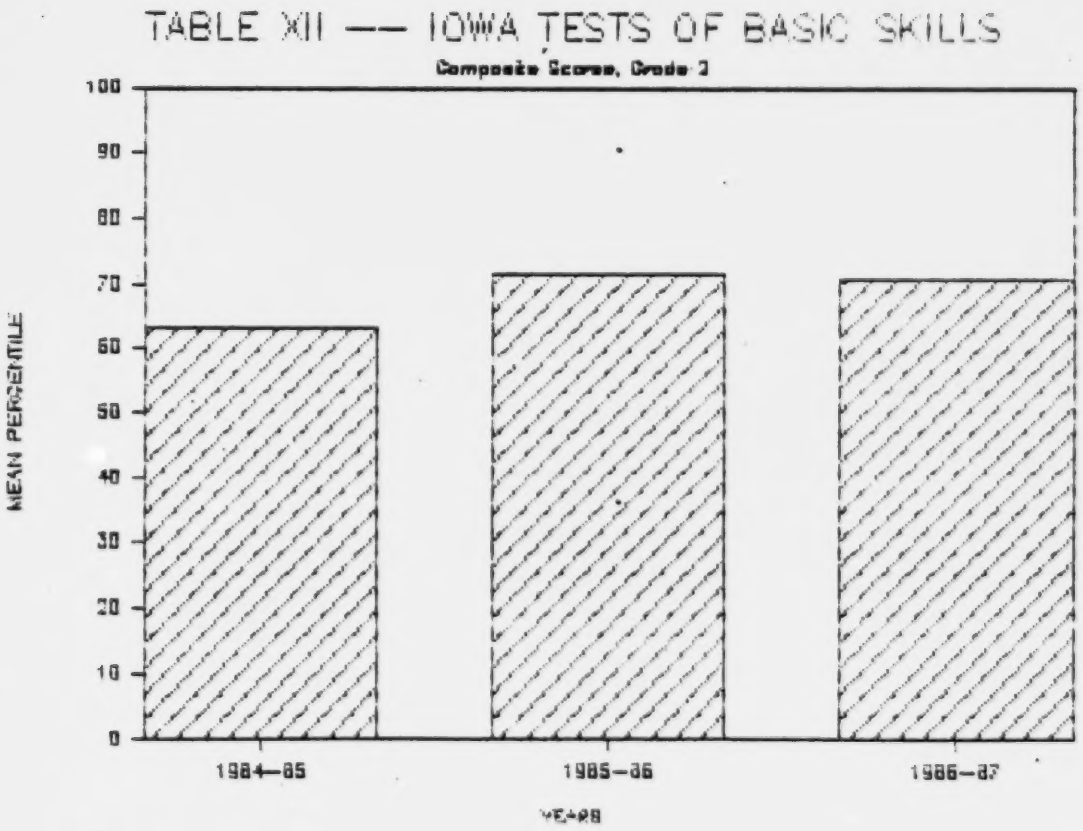

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Table XIII

Iowa Test Scores, Math Subtest, Grade 3
(Study 11)

	1985-86	1986-87
N	161	183
Mean Percentile	67.3	71.9
Standard Deviation	18.5	21.7
Average Class Size	24.0	18.0

F Ratio = 10.62
Tukey's W Procedure Significance Levels

	1987
1986	.001

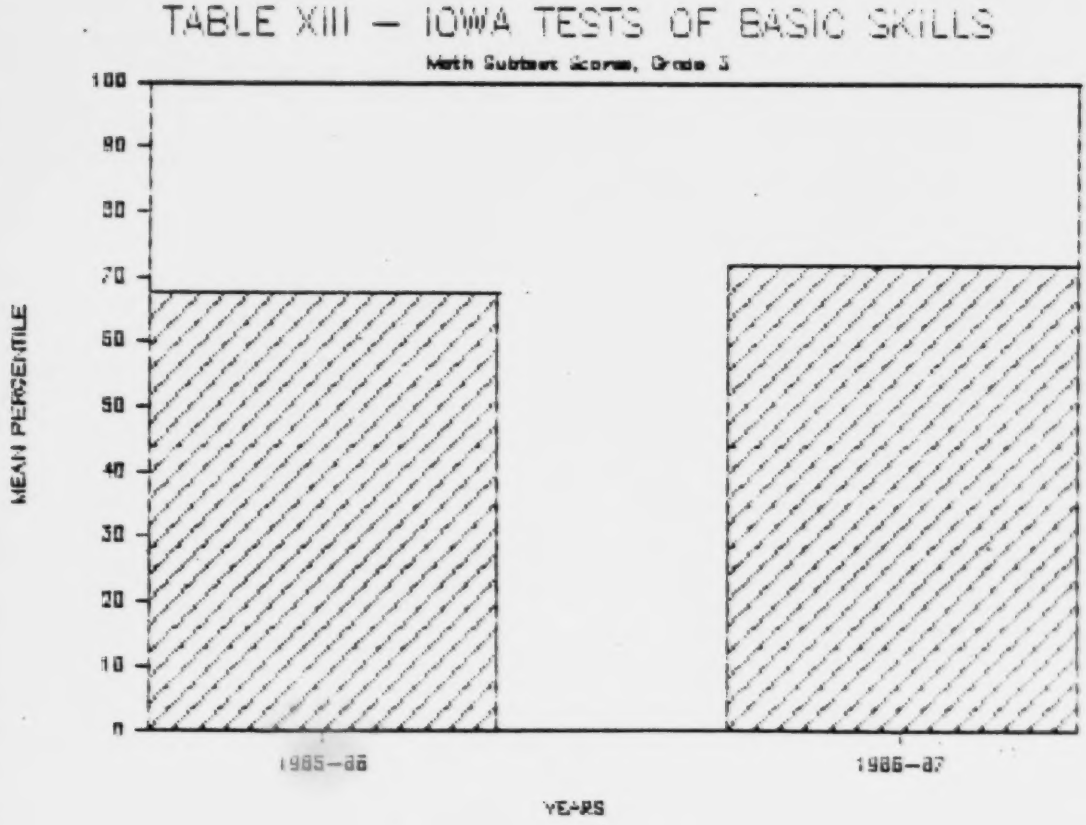

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Table XIV

Iowa Test, Reading Subtest, Grade 3
(Study 12)

	1985-86	1986-87
N	161	183
Mean Percentile	61.1	60.5
Standard Deviation	15.9	17.8
Average Class Size	24.0	18.0

F Ratio = 21.02 (n.s.)

	1987
1986	.001

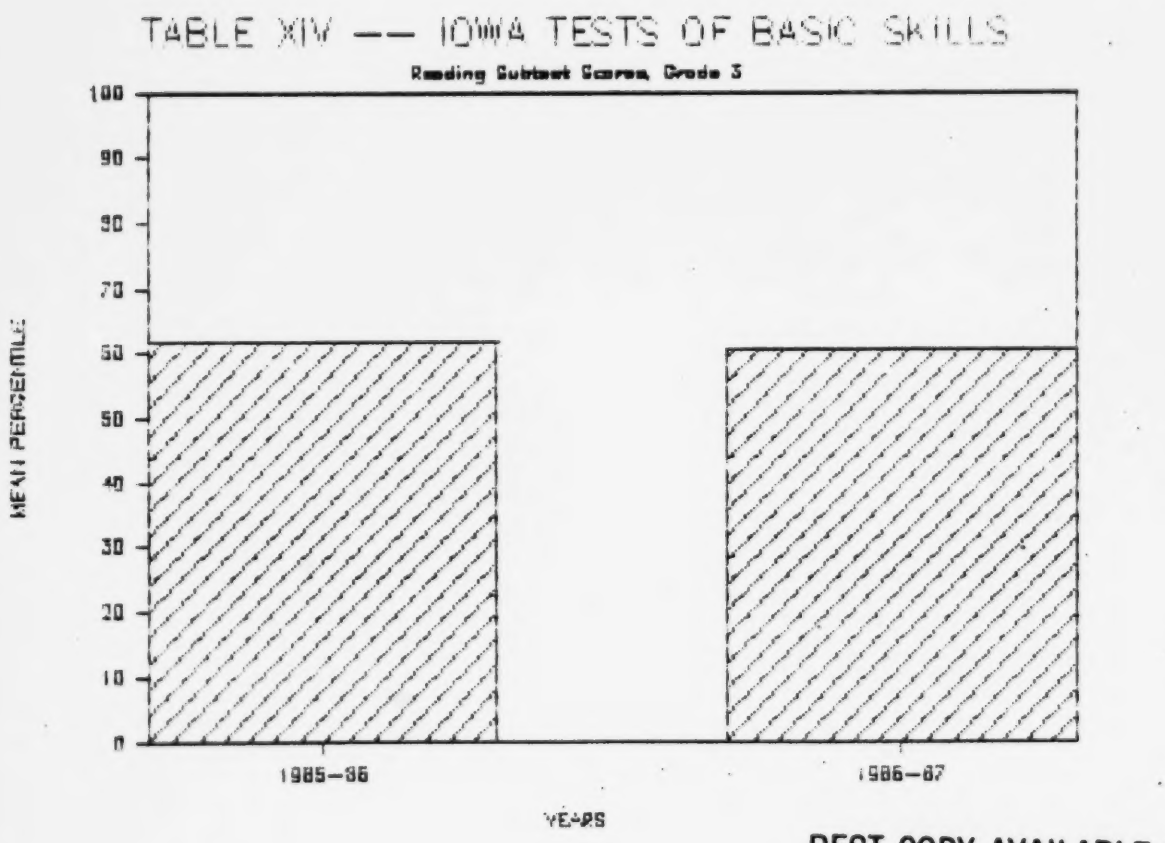

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Table XV

Iowa Test, Composite, Grade 3
(Study 13)

	1985-86	1986-87
N	161	183
Mean Percentile	67.5	69.8
Standard Deviation	16.0	17.7
Average Class Size	24.0	18.0

F Ratio = 2.6 (n.s.)

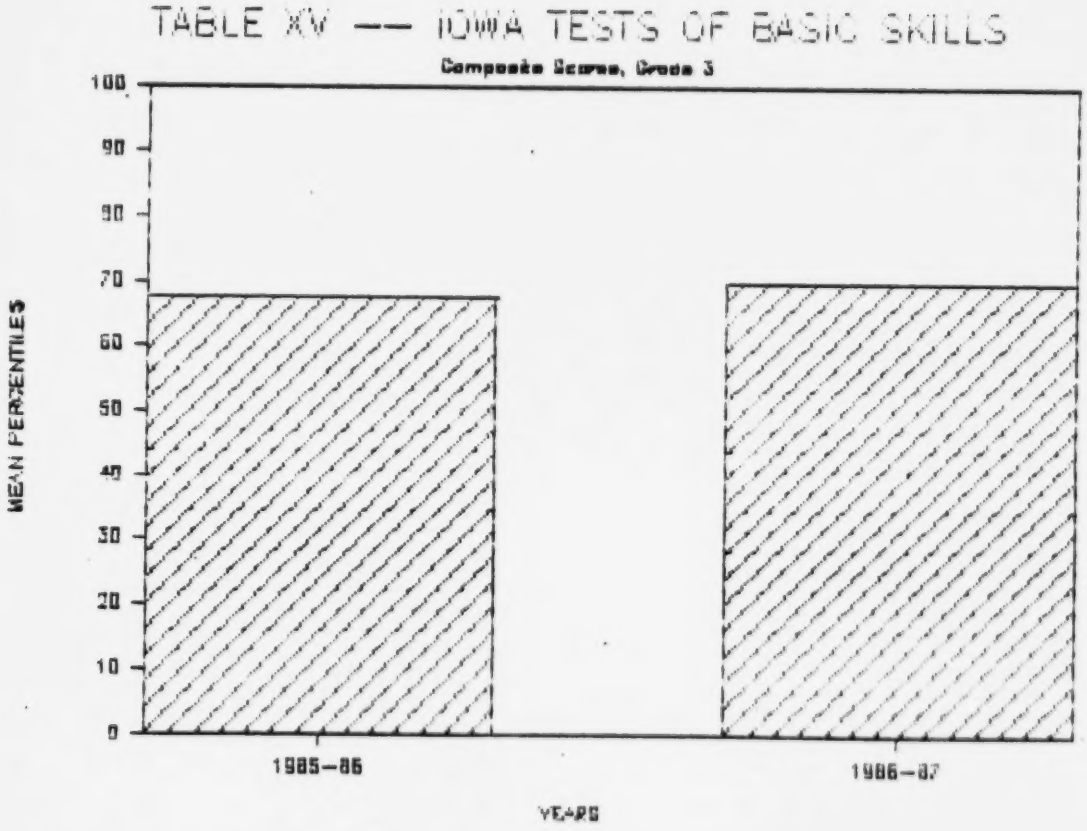

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Table XVI

Indiana Competency Test, Math Subtest, Grade 3
(Study 14)

	1985-86	1986-87
N	161	183
Mean Percentile	36.4	37.0
Standard Deviation	3.3	3.5
Average Class Size	24.0	18.0

F Ratio = .18 (n.s.)

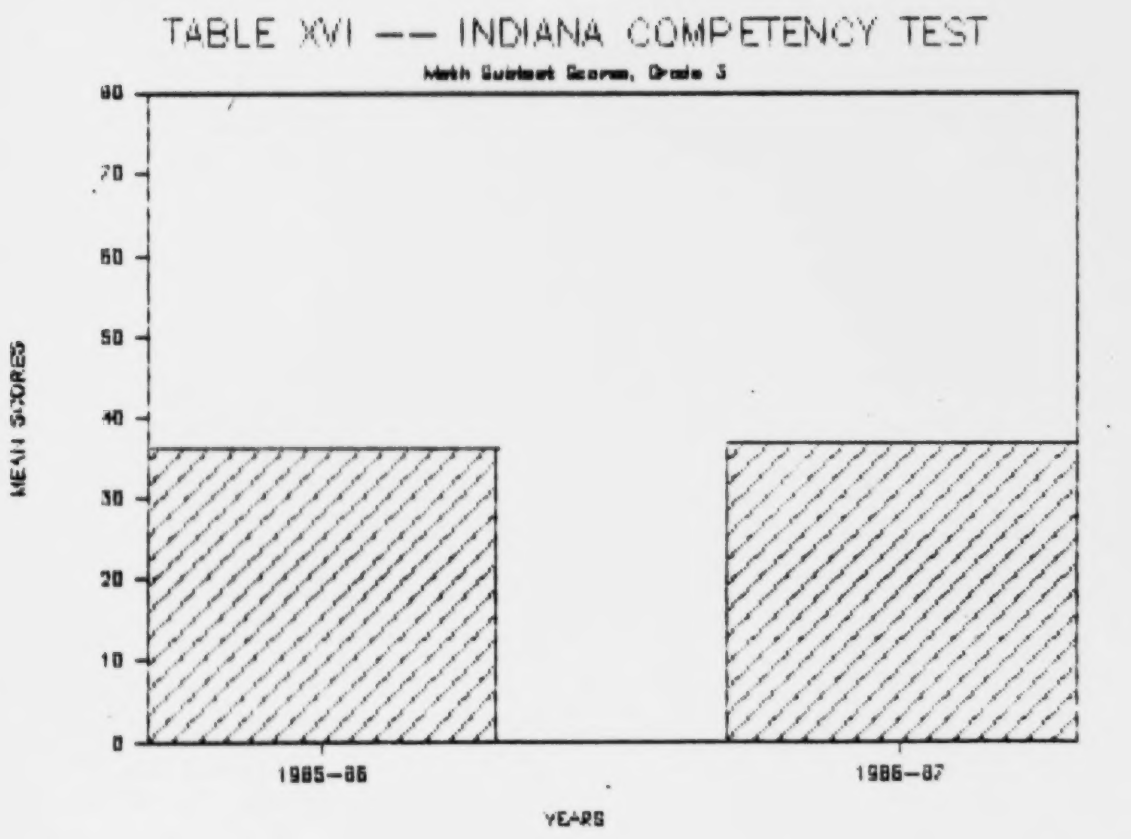

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Table XVII

Indiana Competency Test, Reading Subtest, Grade 3
(Study 15)

	1985-86	1986-87
N	161	183
Mean Percentile	58.5	59.4
Standard Deviation	6.2	6.6
Average Class Size	24.0	18.0

F Ratio = .40 (n.s.)

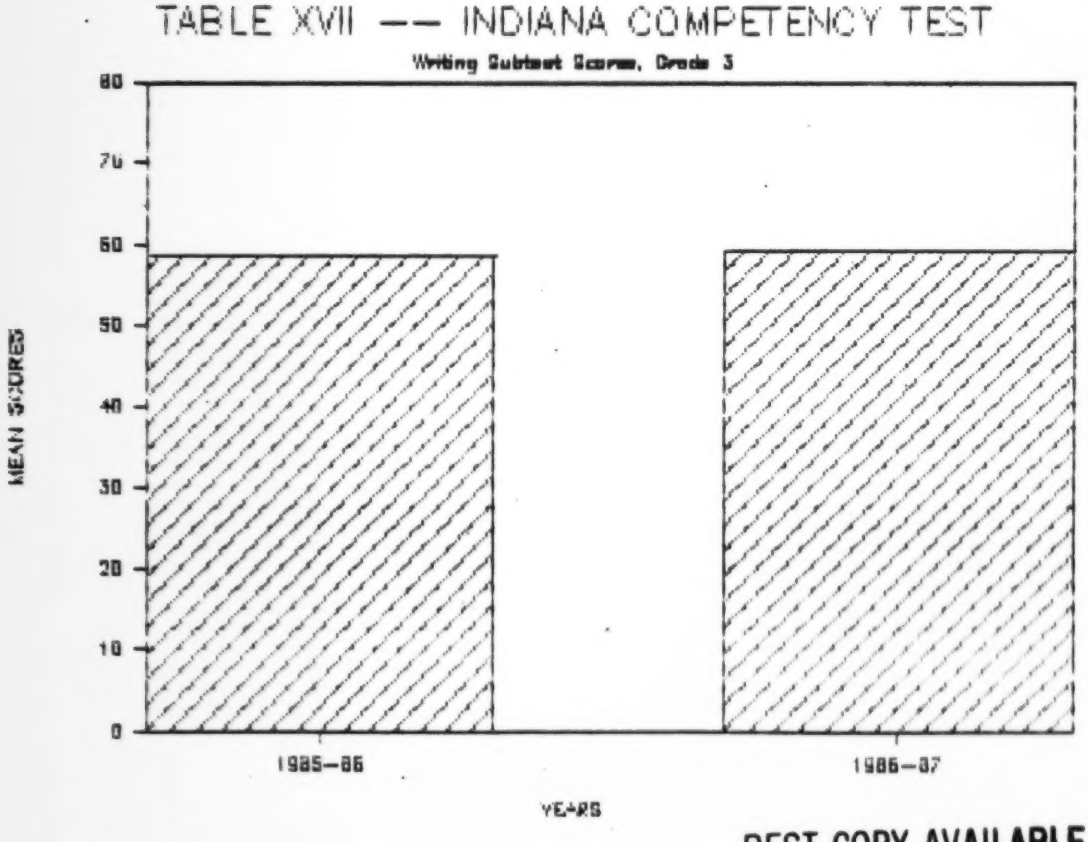

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Table XVIII

Indiana Competency Test, Writing Subtest, Grade 3
(Study 16)

	1985-86	1986-87
N	161	183
Mean Score	29.8	29.3
Standard Deviation	2.7	3.1
Average Class Size	24.0	18.0

F Ratio = .13 (n.s.)

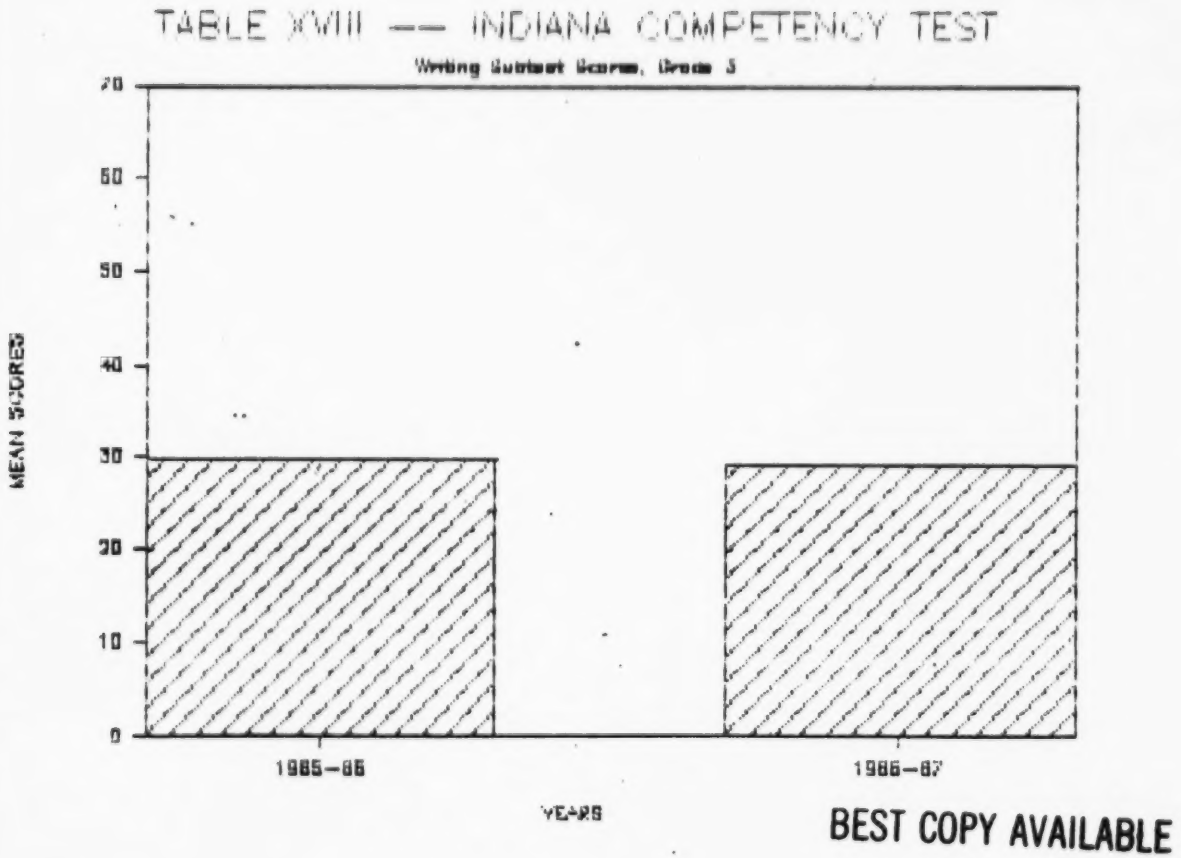

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Table XIX

Indiana Competency Test, Composite, Grade 3
(Study 17)

	1985-86	1986-87
N	161	183
Mean Score	122.2	121.2
Standard Deviation	10.5	11.0
Average Class Size	24.0	18.0

F Ratio = .50 (n.s.)

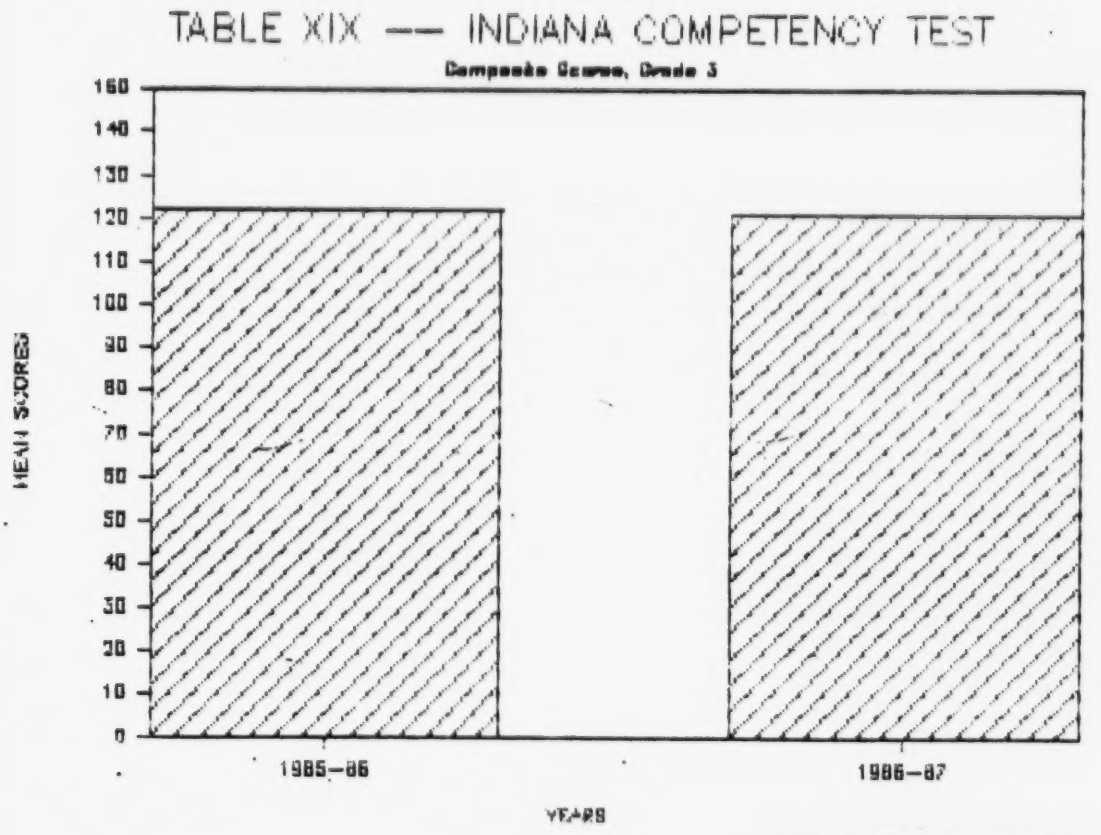

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Table XX

Self Concept Test Scores, Grade 1
(Study 18)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean Percentile	11.4	16.5	15.5	16.0
Standard Deviation	2.5	2.4	2.6	2.5
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 5.46 (p <.01)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985		(-.001)	(-.001)
1986			.001

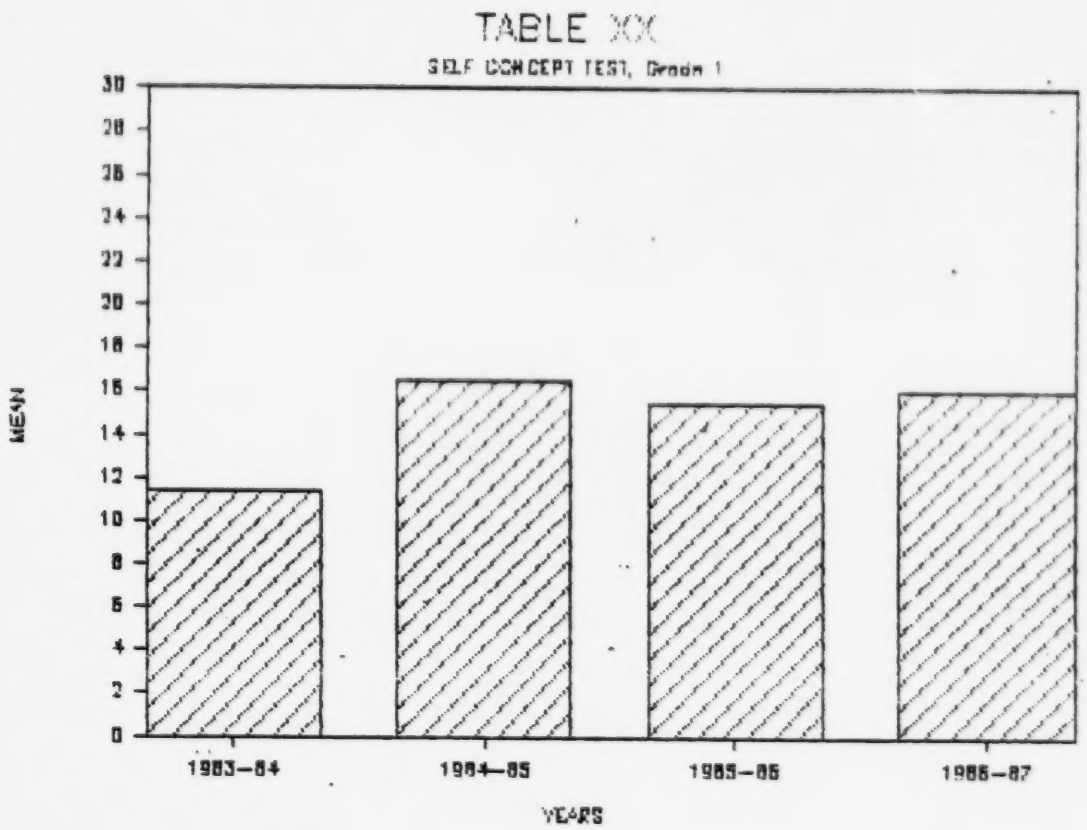

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Table XXI

Attitude Toward School, Grade 1
(Study 19)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean	11.7	12.1	11.5	13.1
Standard Deviation	2.3	2.1	2.2	2.5
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 3.51 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	n.s.	.001
1985		(-.001)	(.001)
1986			.001

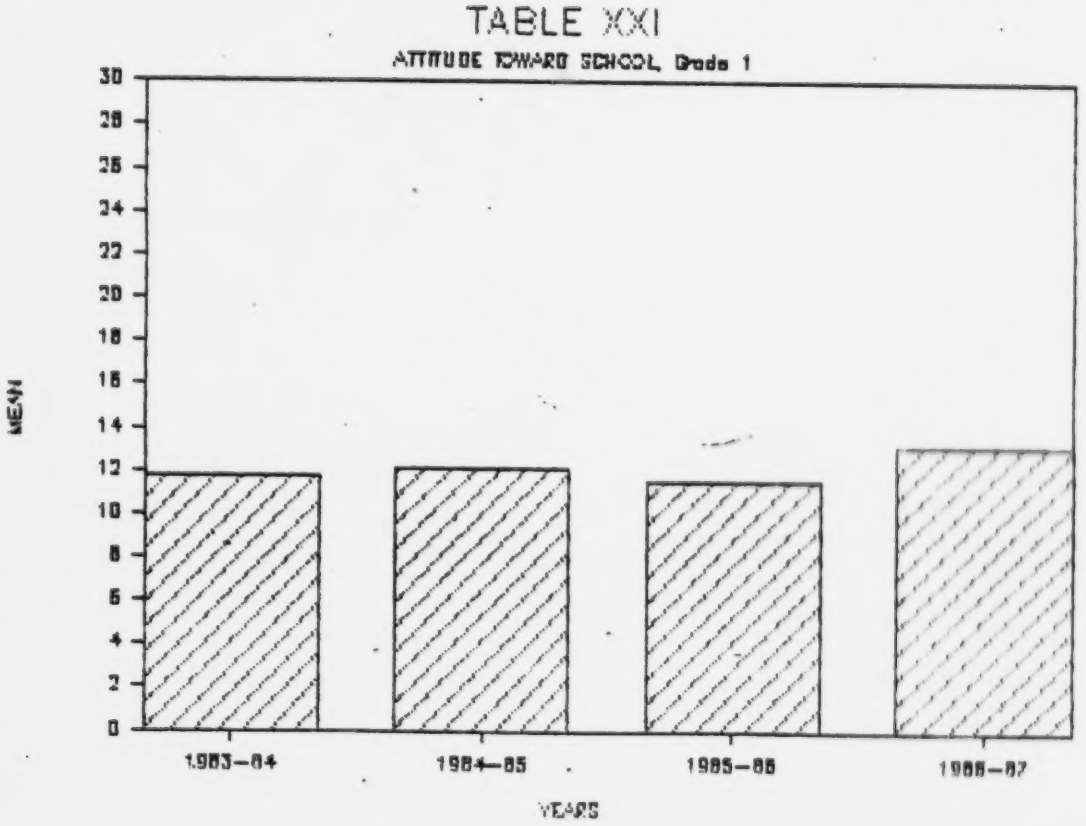

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Table XXII

Total Affective, Grade 1
(Study 20)

	1983-84	1984-85	1985-86	1986-87
N	190	179	161	194
Mean Percentile	22.9	28.6	27.0	29.1
Standard Deviation	5.0	5.1	5.2	5.5
Average Class Size	23.4	17.9	16.1	16.6
	PRIME TIME		LARGE CLASS	

F Ratio = 7.91 (p <.001)
Tukey's W Procedure Significance Levels

	1985	1986	1987
1984	.001	.001	.001
1985		(-.001)	n.s.
1986			.001

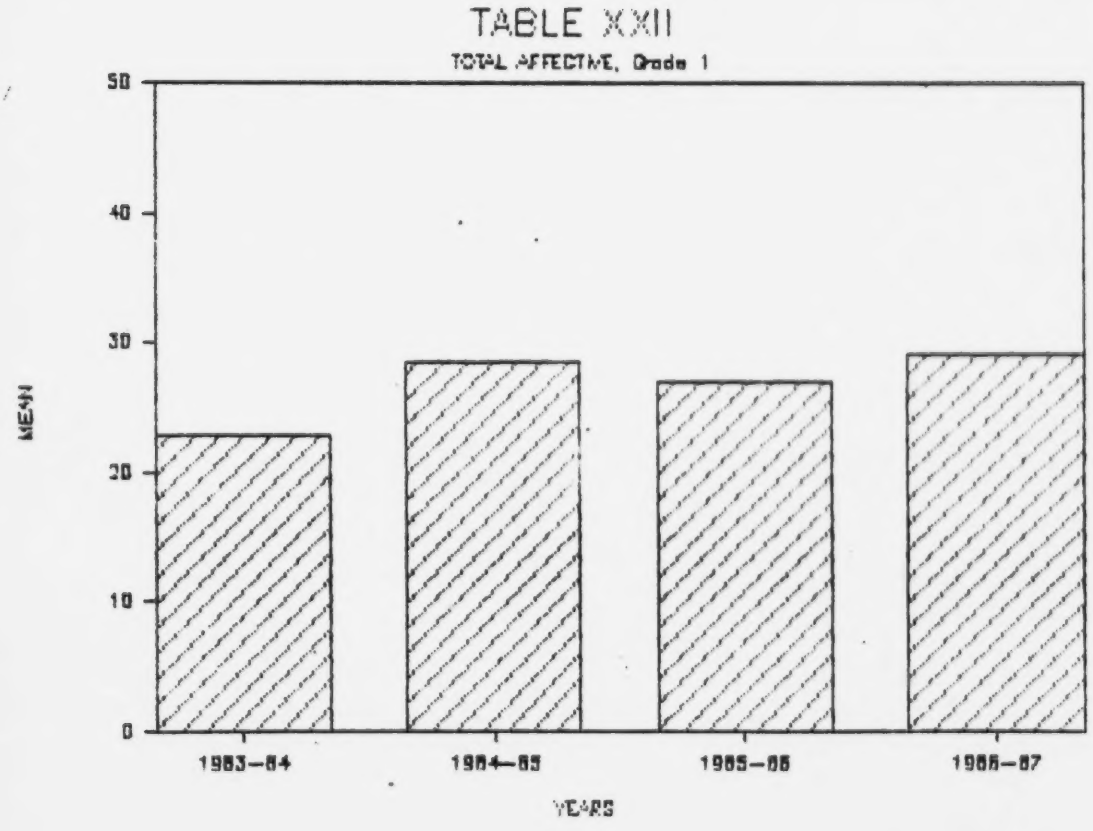

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Table XXIII

Iowa Test of Basic Skills, Social Studies
Supplement, Grade 3
(Study 21)

Mean Scores

	1985-86	1986-87
N	162	185
Mean Score	68.2	69.1
Standard Deviation	23.8	24.3
Average Class Size	24.0	18.0

F Ratio = .41 (n.s.)
Tukey's W Procedure Significance Levels

	1987
1986	n.s.

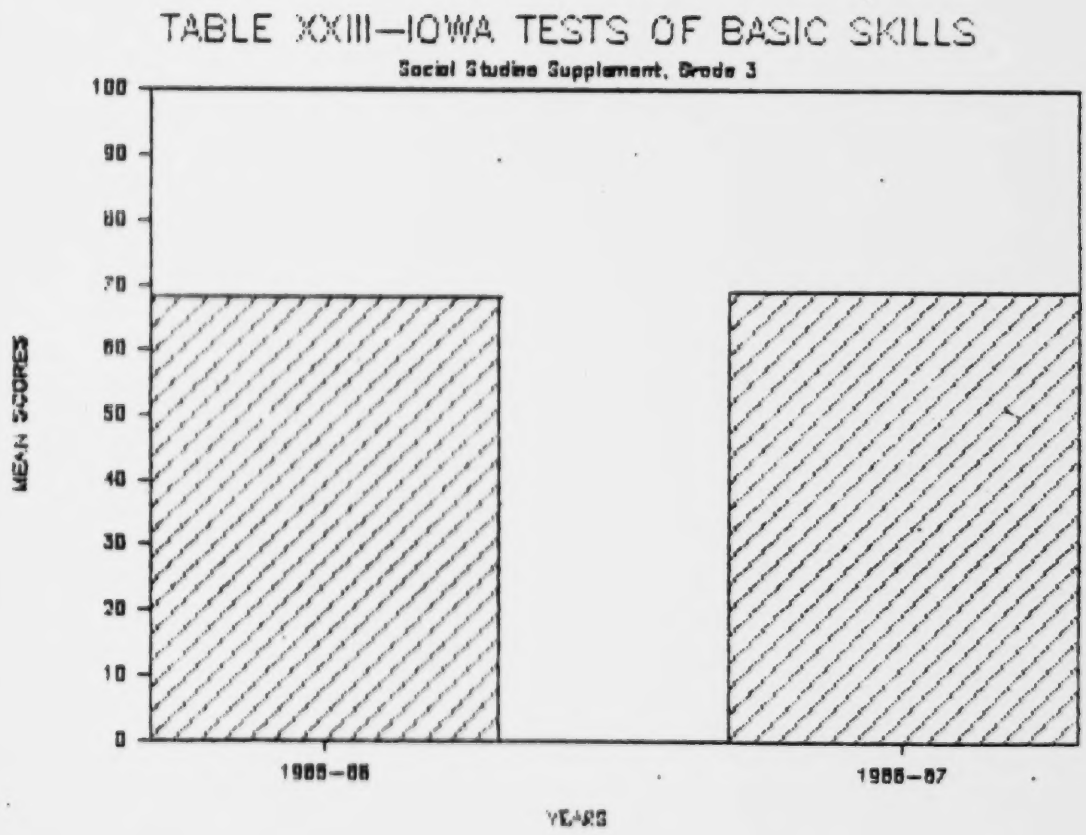

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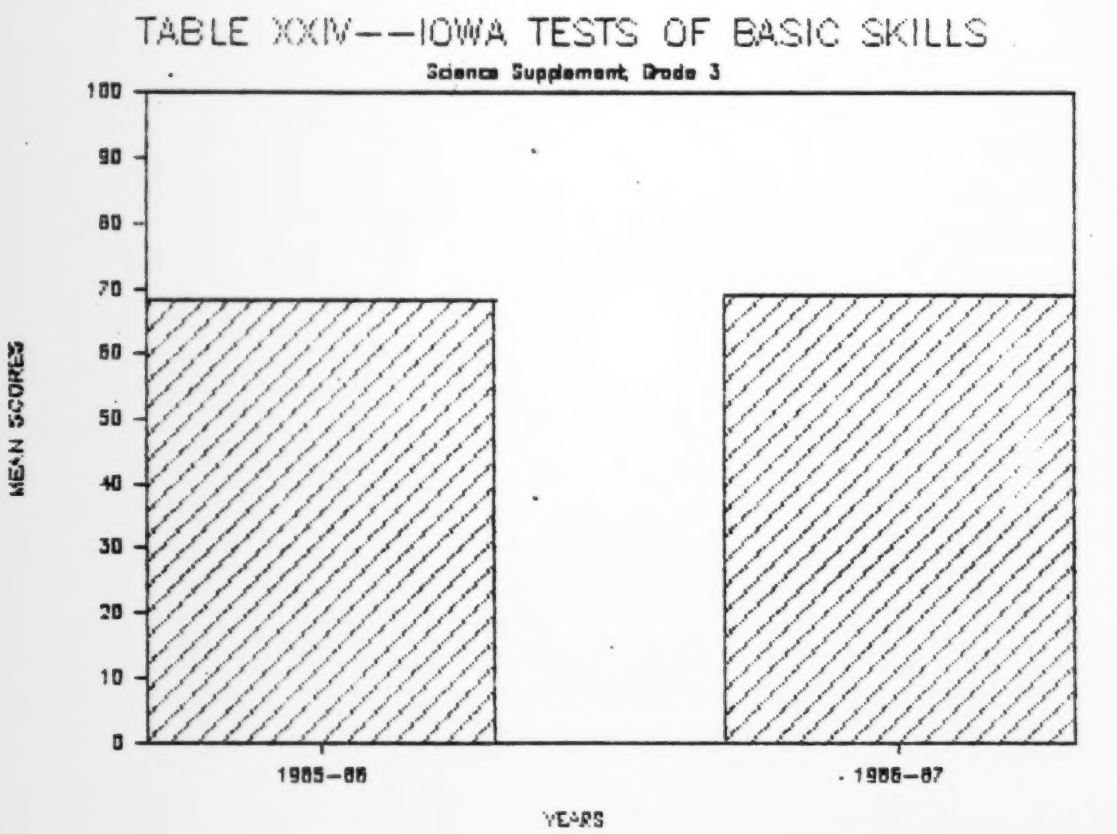
Table XXIV

Iowa Test of Basic Skills, Science Supplement, Grade 3
(Study 22)

	1985-86	1986-87
N	162	185
Mean Score	67.5	68.1
Standard Deviation	23.8	24.1
Average Class Size	24.0	18.0

F Ratio = .18 (n.s.)



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